24. $g(x) = x^{1/3}(x+8)$ find extrema, inc, dec

$g'(x) = x^{\frac{1}{3}} \cdot 1 + (x+8)\frac{1}{3}x^{-2/3}$

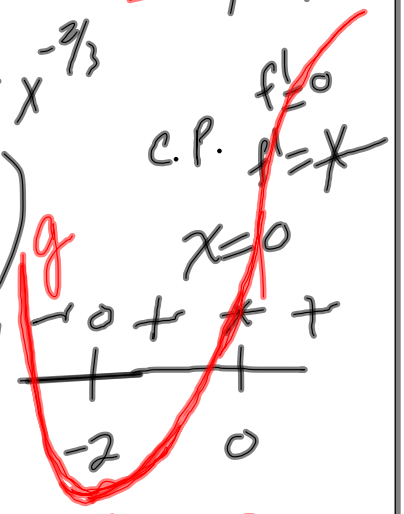
$3\sqrt[3]{x^2}\left(0 = \sqrt[3]{x} + \frac{(x+8)}{3\sqrt[3]{x^2}}\right)$

$0 = 3\sqrt[3]{x^3} + x + 8$

$0 = 3x + x + 8$

$x = -2$

c.p. $f' = 0$ $f' = X$ $x = 0$



abs min at $x = -2$

min is $y = \sqrt[3]{-2} \cdot 6$

inc: $(-2, \infty)$

dec $(-\infty, -2)$

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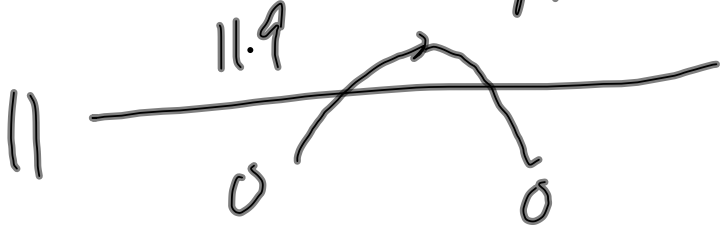
14. $\frac{26.2\text{ m}}{2.2\text{ hr}} = 11.9$ mph ave vel.

MVT at one place where ave vel = Inst. vel

at least one place with inst. vel = 11.9



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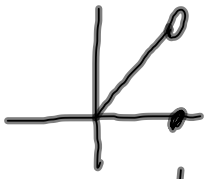
45. $f(x) = \begin{cases} x & 0 \le x < 1 \\ 0 & x = 1 \end{cases}$ $[0,1]$



can't apply the mvt because f(x) not continuous on $[0,1]$

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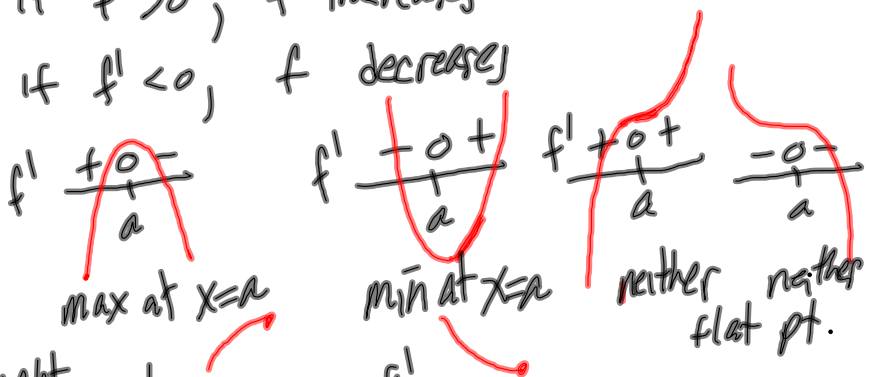
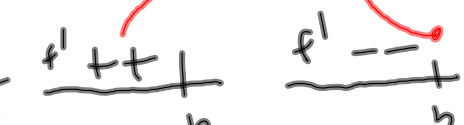
4.3 relation between f, f' and f''

if $f' > 0$, f increases

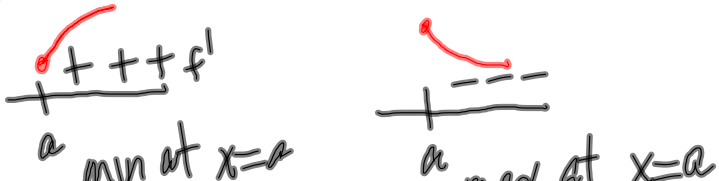
if $f' < 0$, f decreases



right endpt



left endpt



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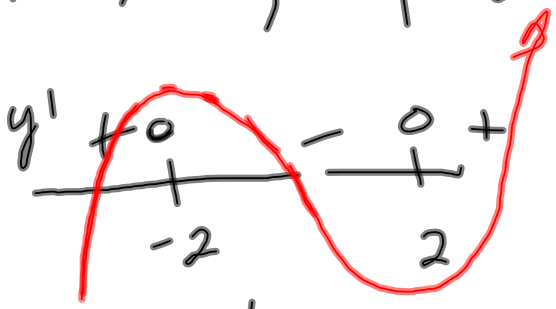
$y = x^3 - 12x - 5$ find extrema, inc, dec

$y' = 3x^2 - 12 = 0$

$3(x^2 - 4) = 0$

$3(x-2)(x+2) = 0$

$x = \pm 2$



max at $x = -2$

min at $x = 2$

inc $(-\infty, -2) \cup (2, \infty)$

dec $(-2, 2)$

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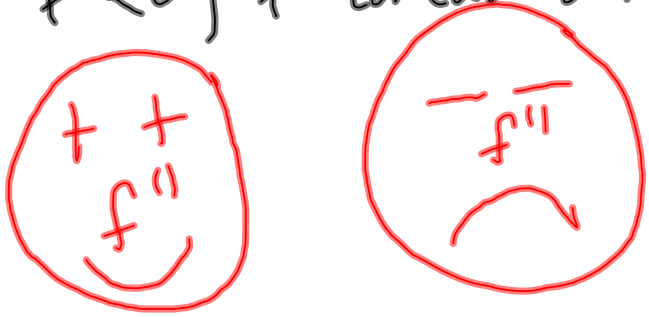
f concave down = slopes get smaller, f' dec, $f'' < 0$

f concave up = slopes get bigger, f' inc, $f'' > 0$

If $f'' > 0$, f concave up

If $f'' < 0$, f concave down



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Ex 3 $y = e^{-x^2}$ find inflection pts

$y' = e^{-x^2}(-2x)$ y' $+ \; 0 \; -$ $x = -\sqrt{\frac{1}{2}}$, ↑ $x = \sqrt{\frac{1}{2}}$ changes concavity

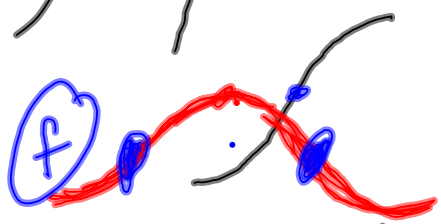
$y'' = e^{-x^2}(-2) + (-2x)(-2xe^{-x^2})$

$= e^{-x^2}(-2 + 4x^2) = 0$

$-2 + 4x^2 = 0$

$x^2 = \frac{1}{2}$

$x = \pm\sqrt{\frac{1}{2}}$



y'' $+ \; 0 \; - \; - \; 0 \; +$

$-\sqrt{\frac{1}{2}} \qquad \sqrt{\frac{1}{2}}$

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